

REMARKS

In the Office Action dated August 3, 2010,

Claims 9 and 5 were rejected under 35 USC § 103(a) as obvious over Yajima '875 in view of Isogai (U.S. Pat. 6,736,900), Kawata, and Butler (US 20050139344);

Claims 6 and 7 were rejected under 35 USC § 103(a) as obvious over Yajima '875 in view of Isogai, Kawata, and Butler, and further in view of Kawano; and

Claim 8 was rejected under 35 USC § 103(a) as obvious over Yajima '875 in view of Isogai, Kawata, Butler, and Kawano, and further in view of Fedulov.

Claim 9 is amended and claim 13 is added to incorporate subject matter previously disclosed at least in paragraphs 30, 31, and 46 and in Figures 1 and 3 of the written description. No new matter is added. Claims 5-9 and 13 are pending.

Applicant respectfully traverses the rejections as follows.

Claims 9 and 5 were rejected under 35 USC § 103(a) as obvious over Yajima '875 in view of Isogai (U.S. Pat. 6,736,900), Kawata, and Butler (US 20050139344).

Claim 9 recites a chemical liquid supply apparatus comprising a pump and a nozzle body. In light of the specification, a chemical liquid supply apparatus is a device used to dispense "a chemical liquid such as a photoresist liquid, a spin-on glass liquid, a polyimide resin liquid, pure water, an etching liquid, and an organic solvent", specifically during etching of a semiconductor substrate. See instant specification pars. 2-5. Claim 9 further recites "a nozzle assembly, in which the pump, the nozzle body, a primary-side valve ... and a secondary-side valve ... are provided".

Yajima '875 teaches a pump integrally arranged together with a solution storage chamber and with a filter unit to form a chemical liquid supply system

body 1. See Yajima '875 Abstract and par. 44. However, Yajima fails to teach or suggest a pump incorporated into a nozzle assembly. See Office Action par. 4. Instead, Yajima '875 specifically teaches that the chemical liquid supply system body 1 is distally connected, via a solution delivery path 17, to a separately located nozzle body 18. See Yajima '875 pars. 51-52 and Figures 2, 5-7, and 9. Thus, if anything, Yajima '875 teaches away from integrating a pump into a nozzle assembly as recited by claim 9.

The Expert Declaration submitted June 22, 2010 further explains why one of ordinary skill in the art of semiconductor etching, without benefit of the instant written description, would have been motivated to keep a pump far separated from a chemical liquid dispensing nozzle, contrary to the recitations of amended claim 9.

Isogai teaches, within the specific context of applying hot melt adhesives to printed circuit boards, an apparatus including a fluid supply device, a delivery nozzle, a pump disposed between the fluid supply device and the delivery nozzle, and a pump control device. See Isogai Abstract and col 1 line 17 – col. 2 line 10. The Examiner alleged that Isogai teaches, generically, incorporating Yajima's pump into a nozzle body. See Office Action par. 4.

However, in the specific context of Isogai's disclosed apparatus (hot melt adhesives, and printed circuit board), concerns of particle reduction, temperature/ viscosity control, and locational precision are not relevant to the same extent as discussed in the Expert Declaration submitted June 22, 2010. In particular, one of ordinary skill will recognize that feature sizes on printed circuit boards are on the order of millimeters, while etched feature sizes on semiconductors are on the order of nanometers. Thus, Isogai fails to provide specific teaching, within the relevant art, of applying chemical liquids during semiconductor substrate etching.

Further, Isogai specifically teaches a pump 94 driven by a screw drive motor 240 which is mounted with Isogai's dispensing nozzle 90. See Isogai col. 15 lines 1-10 and Figure 3. As discussed in the inventor's Expert Declaration,

pump motors are not acceptable in the vicinity of semiconductor etching. For at least the above stated reasons, Isogai does not overcome the inventor's expert statements regarding the level of ordinary skill at the time the instant invention was made. In particular, Isogai fails to teach or suggest, within the specific context of semiconductor substrate etching, a pump provided in a nozzle assembly as recited by claim 9.

Thus, even in view of Isogai's screw pump used for hot melt adhesive deposition onto printed circuit boards, one of ordinary skill in the art of semiconductor substrate etching would not have been motivated to incorporate any pump, even Yajima's pump, into a nozzle assembly of a chemical liquid supply apparatus. However, should the Examiner believe further amendment of claims would be helpful in distinguishing the instant invention from Isogai, Applicant respectfully invites the Examiner to contact Applicant's undersigned representative for scheduling a telephone interview.

Kawata teaches a chemical coating apparatus has a heat exchanger disposed along a pipe for transporting a chemical for adjusting the temperature of the chemical to a predetermined value through a corresponding flow of constant-temperature water. Therefore, it is possible to make uniform the thickness of chemical films applied to objects. See Kawata Abstract. Kawata further teaches a resist supply device (not shown), which is disposed separately from the nozzle. See Kawata col. 3 lines 32-36. Applicant respectfully submits that Kawata's resist supply device or pump is disposed separately from the nozzle for at least the same reasons discussed in the Expert Declaration submitted June 22, 2010, and that Kawata further supports Applicant's contentions regarding ordinary skill in the art. Thus, Kawata fails to supply the deficiencies of Yajima '875 and of Isogai.

The Examiner alleged that Butler teaches first and second coupling blocks. However, Butler teaches nothing regarding a pump provided in a nozzle assembly. Thus, Butler fails to supply the deficiencies of Yajima '875, of Isogai, and of Kawata.

For at least the above-stated reasons, claim 9 stands allowable over the cited references.

Additionally, claim 9 further recites a double tube including an internal tube containing the primary-side chemical liquid flow path, and an external tube in which the internal tube is disposed and in which temperature control water flows in a same flow direction as that of the chemical liquid for adjusting a temperature of the chemical liquid passing through the internal tube.

Yajima '875 does not teach or suggest such a double tube. See Office Action par. 5. The Examiner alleged that Kawata teaches a double tube as recited by amended claim 9. See Office Action, par. 6. However, by contrast to amended claim 9, Kawata teaches a chemical 5 flows in a pipe 9, which is surrounded by: a conduit 10a provided with a constant-temperature water inlet 10c from which constant-temperature water 7 flows into the conduit; and a jacket 10b disposed surrounding the conduit 10a and the pipe 9, through which the constant-temperature water flows to a constant-temperature water outlet 10d. See Kawata col. 2 line 58 – col. 3 line 9 and Figures 2-5.

Kawata further teaches an auxiliary heat exchanger 11 is disposed along a part of the pipe 9, and has first and second heat exchanging pipes 11a and 11b. The first heat exchanging pipe 11a is disposed generally parallel to that part of the pipe 9, and receives from the conduit 10a the constant-temperature water 7, and discharges the constant-temperature water at an end 11c opening in the vicinity of the nozzle 8. The second heat exchanging pipe 11b surrounds the first exchanging pipe 11a and the part of the pipe 9 extending between the nozzle 8 and the first heat exchanger jacket 10b, so that the constant-temperature water 7 returns from near the nozzle 8 via the second heat exchanging pipe 11b. See Kawata col. 3 lines 9 – 27 and Figures 2-5.

Thus, contrary to the double tube recited by amended claim 9, Kawata teaches three flow paths inside each of the main and auxiliary heat exchangers 10

and 11. As shown in Kawata FIGS. 2 and 3, in the main heat exchanger 10 the pipe 9 is disposed a predetermined interval away from the conduit 10a and is disposed spirally and, concurrently, in the auxiliary heat exchanger 11 the pipe 9 is disposed parallel to the first heat exchanging pipe 11a. Thus, the temperature of the chemical 5 flowing in Kawata's pipe 9, is adjusted not by the constant-temperature water that flows in the conduit 10a and the first heat exchanging pipe 11a, but rather by the constant-temperature water that flows out from the opening end 11c of the first heat exchanging pipe 11b to the second heat exchanging pipe 11b to return into the jacket 10b from the second heat exchanging pipe 11b. Namely, a flow direction of the constant-temperature water 7 that temperature-adjusts the chemical 5 is reverse to a flow direction of the chemical 5. This becomes possible because the three flow paths structurally exist simultaneously inside each of the main and auxiliary heat exchangers 10 and 11.

By contrast, amended claim 9 specifically recites "an external tube in which the internal tube is disposed and in which temperature control water flows in a same flow direction as that of the chemical liquid for adjusting a temperature of the chemical liquid passing through the internal tube". Also, amended claim 9 specifically recites "a return path tube connected separately from the double tube between the nozzle assembly and the temperature controller".

That is, the external tube in the double tube is connected to the temperature control water flow path surrounding the pump chamber, but is not connected between the temperature control water flow path and the nozzle. The temperature control water, which has passed through the temperature control water flow path, is returned from the return path tube that is different from the double tube. Accordingly, the chemical liquid, which flows in the internal tube, can be temperature-adjusted by the temperature control water that flows in the external tube in the same flow direction as that of the chemical liquid, and further the chemical liquid, which is accommodated in the pump chamber before dispensed to the secondary-side chemical liquid flow path, can be also

temperature-adjusted by the temperature control water that flows in the temperature control water flow path.

Therefore, the invention as defined by amended claim 9 has the effect that the double tube including the internal tube in which the chemical liquid flows and the external tube in which the temperature control water flows is connected on a primary side of the pump; also, resistance on a secondary side of the pump is small and stabilized; therefore, the predetermined amount of chemical liquid can be stably dispensed; and it is possible to save trouble of resetting operation timing of the pump and various valves whenever the kind of the chemical liquid is changed, thereby improving operability. See instant specification par. 17.

For at least the additional reasons stated above, amended claim 9 stands allowable over the cited references.

Having clearly distinguished amended claim 9 from the cited prior art, Applicant therefore requests that the obviousness rejections of claim 9 and of dependent claim 5 be withdrawn.

Claims 6 and 7 were rejected under 35 USC § 103(a) as obvious over Yajima '875 in view of Isogai, Kawata, and Butler, and further in view of Kawano. Claim 8 was rejected under 35 USC § 103(a) as obvious over Yajima '875 in view of Isogai, Kawata, Butler, and Kawano, and further in view of Fedulov. These claims all depend from amended claim 9. Kawano and Fedulov fail to teach or suggest the recitations of amended claim 9 that are not taught by the combination of Yajima '875 with Isogai, Kawata, and Butler.

Thus, even the combination of all cited references still fails to render obvious amended claim 9, and likewise fails to render obvious claims 6-8 depending therefrom. Accordingly, Applicant respectfully requests that the obviousness rejections of dependent claims 6-8 be withdrawn.

New Claim 13

Applicant deems that new claim 13 is allowable at least because each of the cited references, or any combination thereof, fails to teach or suggest “an external tube in which the internal tube is disposed and in which temperature control water flows in a same flow direction as that of the chemical liquid for adjusting a temperature of the chemical liquid passing through the internal tube”, so that the internal and external tubes in the double tube have the same flow direction. Also, the cited references, or any combination thereof, fail to teach or suggest “a return path tube connected between the nozzle assembly and the temperature controller separately from the double tube”, so that the return path tube is provided separately from the double tube having the internal and external tubes. Separate provision of the return tube path simplifies the arrangement of the tubes so that greater freedom of movement may be provided to the nozzle body.

Conclusion

Having demonstrated that each pending claim stands allowable as amended herein, Applicant respectfully requests that the Examiner withdraw all rejections and allow claims 5-9 and 13. However, if the Examiner believes any issues remain outstanding to prevent allowance of the claims presented herein, Applicant respectfully requests that the Examiner contact Applicant's below-signed representative at the listed telephone number to schedule an interview for expedited resolution of such issues.

Application Serial No.: 10/593,607
Office Action dated: August 3, 2010
Response to Office Action dated: November 3, 2010

Applicant believes no fees are due in connection with this Amendment and Response. If additional fees are deemed necessary, Applicant's Attorneys hereby authorize the Commissioner to deduct such fees from our Deposit Account 13-0235.

Respectfully submitted,

By: / Alan T Harrison /
Alan T. Harrison
Reg. No. 58,933
Attorney of Record

Customer Number 35301
McCormick, Paulding & Huber LLP
CityPlace II, 185 Asylum Street
Hartford, Connecticut 06103-3410
Phone: (860) 549-5290
Fax: (860) 527-0464